Is the psychology of high profits favorable to industrial renewal? Experimental evidence for the theory of transformation pressure and Schumpeterian economics

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Abstract:
The theory of transformation pressure sheds light on the importance of negative driving forces for economic growth and the countercyclical movement in innovations and productivity growth. The theory suggests that firms have a status-quo bias in periods of increasing profits leading to lower productivity growth. Firm agents are governed by changes in current profits through historical relativism, the peak-end rule and overconfidence. They will first abandon a status-quo bias after an actual decline in profits though both under- and overreaction is possible. On the other hand Schumpeterian economics stress that firm renewal is speeded up during recoveries, e.g. by psychological reasons. The two contradicting hypotheses were tested by a role play where a group of university students in economics completed a questionnaire acting as managers for an established company. The students had the opportunity to choose between different growth strategies and define the underlying psychological mechanism. The questionnaire also provided room for rational considerations. The role play confirmed the theory of transformation pressure more than Schumpeterian economics but primarily that the students expected that they would have reacted rationally as managers.

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1. Introduction

Today economists use psychological concepts such as present-biased preferences (hyperbolic discounting), overconfidence, overreaction, anchoring effects, herd behavior and loss aversion in the analysis of consumption patterns, household saving, labor-market behavior and financial investments. Furthermore, game theorists and experimentalists focus on the psychology of strategy choices and investment decisions. But the analysis of industrial renewal and the business cycle has largely been untouched by the growing concern for psychology in economics.[1] In many respects the psychology of financial agents is also the psychology of firms in the non-financial business sector.

In the 1990s a combined psychological and structural theory of transformation pressure was developed in Sweden at the initiative of a productivity commission blaming devaluations for the country's poor productivity performance in the previous decade (Swedish Productivity Commission, 1992). The commission maintained that the associated profit increase in the exposed sector, notwithstanding its temporary character, delayed structural change and the firms' use of production slacks and introduction of new products, technologies and organizations. Accordingly the theory of transformation pressure (henceforth TTP) came to emphasize that productivity growth is hampered by high current profits (Erixon, 2007).

[1] There are some exceptions, see for example, Jaimorich and Rebelo (2007).

The aim of this paper is to present the hypotheses and underlying psychological mechanisms in the TTP. The theory sheds light on the importance of negative driving forces for macroeconomic developments and, therefore, on the countercyclical movement of innovations and productivity (growth). A further aim of this paper is to compare the psychology of the TTP with that of Schumpeterian economics. In the analysis of the business cycle and of economic progress Schumpeterian economists stress the importance of positive driving forces for innovations and productivity. New technical opportunities, learning and spillover effects, scale advantages and large financial endowments (especially for R&D investments) will lead to firm renewal, procyclical innovations and productivity growth and to virtuous growth circles in the economy. The positive driving forces are also psychological in Schumpeterian economics. For example, some Schumpeterian economists maintain that decision makers in the firms become more optimistic and risk-prone in a recovery leading to higher R&D investments.

This paper also presents the results from an experimental role play testing the validity of the TTP and the Schumpeterian theories under review. The role play was also designed to provide room for rational motifs. The game was played by 85 students in economics at Stockholm University. The students were asked to make decisions on investment and growth strategies by acting as leaders of an

established company. They were also asked to describe their own view of the underlying psychological mechanisms.

This paper will *not* scrutinize the structural and institutional preconditions for firm behavior in the TTP. Neither is the focus on the 'structural' hypothesis in the TTP (and also in Schumpeterian economics) that high profits will delay the elimination of inefficient firms (and plants) and the phasing out of stagnating industries having a negative effect on aggregate productivity growth. We will also disregard in this paper the productivity performance of new firms. Our focus on the productivity development of established firms is legitimized by empirical studies demonstrating the decisive role of 'within-firm' effects (in contrast to changes in the composition of plants and firms) for productivity changes on the aggregate level (see World Bank, 2008, ch. 3). Furthermore the paper will only pay attention to the behavior of established firms in periods of increasing profits and the reaction by these firms to a sudden decline in actual profits. Thus, in terms of the business cycle, the paper will consider the behavior of established companies in the recovery phase and at the upper turning point. The business-cycle perspective in this paper hides that the TTP is basically a theory of economic growth. Permanent negative shocks are expected in this theory to foster more innovations in the long run and, as temporary negative shocks,

irreversible changes in industrial composition, for example, by stopping path-depending industrial processes with a limited productivity potential.[2]

2. Basic notions and hypotheses in the theory of transformation pressure

The central idea in the TTP that productivity is enhanced by falling profits is not new. Theories of bounded rationality envisage the growth-enhancing effects of negative driving forces. They suggest, as the TTP, that deviations from profit maximization are smaller if firms are put under external pressure. In his theory of X-inefficiencies Harvey Leibenstein postulated a positive relationship between competitive conditions and productivity through variations in managerial effort. The literature on X-inefficiencies focuses on the use of production slacks (rationalization). But Leibenstein and others have also considered the possibility that external pressure would augment the use, and even development, of new technologies (Leibenstein, 1980, 39, 46, 234-236).

There are, however, some unique features of the TTP in relation to the theory of X-inefficiencies. First, when analyzing enforced changes in productivity, the TTP abandons the principal-agent perspective in the X-inefficiency literature. The theory posits that both managers and owners are influenced by the mental

[2] In this paper we will also exclude the argument in the TTP that falling profits will stimulate the creativity and skill of firm agents – necessity is the mother of invention (see Erixon, 2007, pp. 338-339). We will also ignore the time-pressure aspect of the TTP in (Erixon, 2007).

processes leading to a negative relationship between profits and productivity (growth). Besides, the TTP assumes that rational managers have always incentives to maximize profits of the firm where they are currently employed.[3] To meet inevitable challenges in the future firms must also in good times (even with incomplete knowledge about the scope and nature of the threats) introduce new technologies and products and facilitate the financing of new investments by becoming more efficient. Selfish managers will take these steps if their prestige, career and expected incomes in the business sector are closely related to the profit development and survival of the firm where they are employed at the moment. Furthermore, in the TTP, both managers and owners may give priority to the survival of the firm if there is a trade-off between this goal and profit maximization.

Second, in the TTP, stronger effort by managers (and owners) is not the only explanations for why harder external pressure on firms leads to higher productivity. Productivity can increase in the firms if decision makers simply abandon their too confident view of their current growth strategy and abilities. Third, the TTP stresses that firms will only react to *actual* reductions in profits.

[3] The notion of rationality has a general and specific content in this paper. In the specific case, rationality is defined in terms of (expected) utility and profit maximization (given information costs) and the underlying axioms or in terms of Bayes's rule. In the general (firm) case, rationality is seen as a deliberate activity to increase knowledge about possible investment options and their outcomes (including the probability of different outcomes in the future). The calculation of expected profits can be based on retrospective analyses of historical outcomes. The general notion of rationality also includes activities to increase knowledge about the working of existing technologies and markets (see learning-by-doing) provided that these activities are intentional.

The distinction between expected and actual changes in profits is not crucial in the theory of X-inefficiencies. The latter theory does not preclude that managers must and will react to forthcoming threats to the firm, threats that are inevitable in a market economy (cf. Hermalin, 1992). In contrast, the TTP suggests that firms will first respond when the profit decline is manifest or almost certain. An actual decline in profits will enforce the firms to become more rational. Agents will then e.g. start to collect and process information about possible external threats and alternative growth strategies. They will also meet an actual fall in profits by launching productivity-enhancing programs, possibly by switching to a new growth strategy.

Fourth, the TTP takes a further step in relation to the theory of X-inefficiencies by assuming that firms will only react to *recent* changes in profits. The assumption that firms are governed by current changes in profits builds a bridge between macroeconomics and central notions of heuristic behavior in psychology. It will thereby reestablish the psychological aspects of X-inefficiencies that were elaborated by Leibenstein but largely obscured by other economists (see Leibenstein, 1979, pp. 484-485 and 1985, pp. 6-7). By the assumption that expectations of firm agents are based on current outcomes, thus not on outcomes in the past, the TTP also departs from the rational expectation theory of adaptive learning and the option theory of investment under risk. In these theories expectations of economic agents are based on

actual observations during a long period making it possible to separate between stochastic and systematic changes in prices and profits (Lucas, 1986, S414-416; Dixit and Pindyck, 1994). In the TTP, a current decline in profits will enforce firm agents to become more rational – they will e.g. make effort to disentangle the origin of the profit fall. In the rational theories of investment under risk and adaptive learning a decline in current profits is merely an additional source of information for rational firm agents continuously making efforts to discriminate between temporary and long-run profit developments.

The suggested negative relationship between current profits and productivity does not depend on any specific assumption about uncertainty and risk. In the TTP, companies will postpone measures to increase productivity until the day of a decrease in current profits also in the case of large uncertainties. In this case firms cannot gain reliable information about external challenges by waiting. But rational firms would have considered alternatives to their chosen investment strategy and taken precautions to increase flexibility in production and marketing already before an actual decline in profits. The TTP posits that firm actors will first look for a large number of investment opportunities and make the technical and organizational arrangements needed to increase the firm's adjustment capacity at the time of an actual fall in profits. In the cases where the future is relatively easy to predict firms are supposed not to search for available information until the day of an actual decline in profits.

However, notwithstanding the assumption that a decline in current profits makes firms more rational, the TTP provides room for both under- and overreaction. Firm agents may underreact through the lingering impact of psychological distortions. They can also overreact by introducing extensive measures to increase productivity after a profit decline that is modest, temporary and basically not a threat to the firm's existence. The TTP does not preclude that overreaction (or underreaction) reflects the lack of reliable information. But it emphasizes that agents will incorrectly confuse an actual profit decline with harder transformation pressure by psychological reasons.

Transformation pressure is defined in this paper as a change in external circumstances for firms leading to a sustainable decline in profits and eventually to firm closure unless steps are taken to increase productivity. Established firms may face harder transformation pressure through (permanent) negative demand and supply shocks. Price reductions or the introduction of new products (and product differentiation) by competitors (new or established) is an example of an asymmetric demand shock for an individual firm. An established firm may also be indirectly hit by harder competitive pressure through endogenous increases in nominal wages, interest rates and material prices. For example, wage bidding by expansive firms to attract labor will increase wages for indispensable labor in other firms. It is true that the expansion by dynamic firms may benefit other

firms through production and innovation linkages or positive effects on aggregate demand. However this paper will not pinpoint the demand and knowledge spillover effects of decisions on the firm level. It focuses on the profit-reducing effects of stronger external pressure.

A profit change is associated in this paper with a change in the external circumstances for the firms. However, we do not exclude the possibility that firm agents *believe* that changes in profits reflect internal conditions. For example, actors may make the mistake to attribute a general profit increase to their own (superior) capabilities. In the TTP, the subsequent decline in actual profits will initiate effort to distinguish the origin of this decline, but also of the previous profit recovery.

Furthermore, in this paper we will associate a change in actual profits with a shock. This assumption conforms to the case of large uncertainties (excluding the possibility that agents would provide reliable information be waiting) and also to that of self-deception. In the latter case, changes in external circumstances are unexpected for firm agents who (cheaply) could have gained reliable information about expected profits (possibly about the probability of different outcomes) if they had really searched. External events come as a shock for agents who under the spell of misleading psychological forces (intoxication, haughtiness and repression) have ignored available relevant information.

We will assume throughout the paper that firms make a choice between three growth strategies that are assumed to be mutually exclusive. The first strategy is a pure status-quo option without any changes in technologies, product composition or organizations whatsoever. Investments are only made to increase production capacity or substitute labor. There is not even room here for rationalization, i.e. for the use of production slacks in the firms. Thus, this strategy is not connected with any increase in total factor productivity. The second growth strategy represents a status-quo oriented transformation. Firms will increase total factor productivity by rationalization or by marginal changes in technologies, product composition and organizations. The third growth strategy is a radical transformation constituted by major changes in technologies, product structures or organizations. This strategy is assumed to have a larger growth potential in terms of total factor productivity than a transformation along a status-quo strategy, both for the firm itself and for society at large.

The TTP maintains that firms have a tendency to opt for a status-quo oriented strategy in periods of increasing actual profits. This view on firm behavior does not exclude that status-quo oriented firms spend resources in good times on marginal changes of technologies, product compositions and organizations or on rationalization. But the TTP suggests that short-run increases in actual profits are unfavorable to radical transformation. Furthermore it presupposes that firms in

good times will take fewer measures in general to increase total factor productivity. Thus low total factor productivity growth within firms in a recovery reflects that decision makers will then not only resist radical transformation but also take limited steps to increase productivity by status-quo oriented measures.

According to a special case of the TTP firms are particularly anxious to avoid radical transformation if short-run profits increase to record levels. In this case, an even smaller number of firms are assumed to choose radical transformation in comparison to the case of a general boost in profits. Moreover, when profits soar to record levels, firms that would have chosen a status-quo oriented transformation during a 'normal' profit increase are expected to follow a strategy without any transformation at all. The TTP further assumes that total factor productivity growth in the firms will be particularly low if a recovery turns into a profit boom.

In the TTP firm actors will first take substantial measures to increase total factor productivity and engage in transformation activities after a sudden decrease in actual profits. The TTP does not specify whether firms that had chosen a status-quo strategy without transformation in the previous period will meet a profit decline by transformation along the lines of a status-quo or a radical strategy. But the theory asserts that firms that have opted for a status-quo based

transformation in the period of increasing profits will switch to radical transformation in the subsequent period of dwindling profits.

The distinction between a 'normal' profit increase and a profit boom is also crucial in the TTP where the reaction to a profit decline is concerned. According to a specific version of the theory firms react faster by transformation to a decline in profits if the decline was preceded by a profit boom. Firms that only chose a status-quo option without transformation or a status-quo oriented transformation (instead of a radical transformation) when profits reached record levels are supposed to react immediately to a profit decline by transformation and radical transformation respectively. This specific TTP maintains that more firms are involved in transformation activities after a small decrease in profits if they have previously experienced a profit boom. The theory also suggests that total factor productivity growth in the recession will be higher if a given profit decline was preceded by a profit boom.

The TTP focuses on strategy choices and actions by firms to enhance productivity, not on investments *per se*. The theory does not exclude that harder external circumstances will stimulate investments, especially in R&D. Agents may have the survival of the firm as a superior goal permitting even negative net present values of investments. They may also be convinced that the firm has the necessary competencies to meet external challenges. But investments are likely

to be stimulated by the psychology of a status-quo bias in periods of increasing profits. Accordingly, investments will probably be impeded by psychological factors in periods of an actual decline in profits. We will assume in this paper that physical investments, and also total investments, by firms will increase (decrease) under easier (hasher) external circumstances. Thus the psychological mechanisms favoring a status-quo strategy in good times are also supposed to reinforce a procyclical investment pattern.

3. The psychology of the theory of transformation pressure

3.1 A status-quo bias in recoveries

It is hardly controversial to claim that the expectations of economic agents are formed by actual outcomes when future is uncertain. It is more controversial to maintain a special case of adaptive expectations - people are only governed by current outcomes. A sensible argument is that people make heuristic rather than rational decisions. Daniel Kahneman's peak-end rule states that people's evaluation of earlier experiences is based on two observations only, the last and the exceptional one (see Kahneman, 2003 and Doe and Wolford, 2008). The rule suggests that current profits have a strong impact on firms' investment and strategy decisions. Besides, high current profits will probably extend the use of heuristic decision-making principles *per se* (cf. the X-inefficiency theory).[4] But the

[4] By rejecting the propositions that more of a pleasant experience is always better and more of an unpleasant experience is always worse the peak-end rule breaks with the axiom of dominance in the utility-maximization model. For example, firms governed by the peak-end rule will not

peak-end rule provides room for the possibility that firms are affected by exceptional events, for example a depression, in the past. Furthermore, by emphasizing exceptional events, the peak-end rule implies that firm decisions are particularly sensitive to profits approaching peak or trough levels. Thus, in the analysis of investments and strategy choices, the peak-end rule legitimates a stronger weight to high (and low) current profits.

The heuristic principle of the irrelevance of history (historical relativism) underlines that only current outcomes matter.[5] Firm agents may argue that profit outcomes in the past reflected specific circumstances that are not prevailing anymore. Thus, agents believe that they have nothing to learn from history. A reasonable assumption is that historical relativism is strengthened if the period of increasing profit will last over a couple of years or if it ends with a profit boom. The belief that history cannot provide any guidelines for investments and strategy decisions today may of course be correct. But historical relativism often reflects that people tend to explain their behavior by referring to controlled processes (calculation) and not to automatic and affective forces (see Camerer et al., 2005, pp. 37-38). The peak-end rule, historical relativism and other heuristic principles can be seen as (mostly unconscious) strategies to free people from

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consider a profitable investment (positive marginal profits) as an improvement if connected with a decrease in actual (average) profits.

[5] See Shiller (2001). Robert Shiller relates the phenomenon of the irrelevance of history in financial markets to the heuristic principle of anchoring effects – speculators use recent outcomes as an anchor (Shiller, 2001, p. 1326).

time-consuming and unpleasant calculation activities (see Tversky and Kahneman, 1974, 1986 and Shah and Oppenheimer, 2008). Specifically, the peak-end rule and historical relativism reflect either a limited cognitive capacity (e.g., memory capacity) or an emotional state that can be characterized as a propensity to live in the present.

In the TTP, firm agents governed by historical determinism and the peak-end rule will overreact to an increase in current profits. These agents will also overreact to a profit increase by *overconfidence*. More exactly, a short-run increase in profits is supposed to create or strengthen an overconfident attitude among firm agents.[6] Psychologists claim that overconfidence is common and will not be corrected by learning or even by experts when predictability is low as in the case of stock prices and also of profits in the non-financial business sector (Rabin, 1998, pp. 31-32; Nelson et al., 2001, 172-190; Önkal et al, 2003, pp. 182-183; Hilton, 2003, pp. 274-285, 289-291).[7]

[6] Higher profits make actors (more) overconfident both directly, provided that current outcomes matter, and indirectly through the *extended* use of heuristic decision rules focusing on current outcomes.

[7] The proposition that an increase in short-run profits leads to overconfidence is possibly supported by evidence that people are too confident in a small number of observations with unambiguous outcomes. Economists, statisticians and psychologists alike often emphasize that people's estimation of probabilities is too governed by the exceptional outcomes of small samples (see, for example,Tversky and Kahneman, 1974 and 1986 and Nelson et al., 2001). According to a Bayesian observer people pay too much attention to the strength of evidence at the expense of the weight of evidence (the statistical reliability). However, this literature provides no explanation of why, for example, firm agents are focusing on current outcomes only.

Overconfidence is mostly defined, both in economics and psychology, by reference to Bayesian statistics. However, the difficulties to define true probabilities of different outcomes when the future is genuinely uncertain compel us to define overconfidence (and underconfidence) in terms of a specific mental state. In this perspective overconfidence may characterize, but is conceptually unrelated to, a certain choice or opinion.

We will define three types of overconfidence in connection with an increase in current profits. The first type emphasizes that firm agents will be *intoxicated by success* and therefore lose their sense of proportions when evaluating the profit potential (and risks) of a certain growth strategy or of the firm itself. Thus feelings of success will distort the calculations of expected profits. Decision makers may be convinced that they are actors in a 'new' economy immune to recessions and crises. The second type of overconfidence after a profit increase is the result of *haughtiness*. A temporary profit boost may create an exaggerated belief among firm agents in their own superiority and invulnerability. For example managers become too confident in their capacity, or in the ability of principles and peers, to achieve the firm's profit potential and ward off challenges to the firm in the future. They may also automatically credit themselves (or their colleagues) for a profit increase that was actually caused by an external demand shock or an expansionary economic policy. The third form of overconfidence after an increase in current profits is developed through *repression*, thus

overconfidence is described in psycho-analytical terms. The profit increase may induce firm actors to put information contradicting their current investments and growth strategies in a subconscious mental department (cf. Tuckett, 2009, pp. 4-6). They will e.g. hide the potential risks of large losses and even of bankruptcy in their subconscious mind. Decision makers will suppress their fears of being too risk prone and possibly also of being too emotional in their evaluation of expected profits and their own capabilities. Thus repression can be seen not only as an additional source of overconfidence but also as a necessary condition for the judgment fallacies and self-overrating attitudes associated with the two other forms of overconfidence.

In the TTP firms' focus on current outcomes and overconfidence because of higher profits in the short run will lead to overinvestments (cf. Charness and Levin, 2005, pp. 1304-1308). But more important, the TTP suggests that these overinvestments will favor a status-quo oriented growth strategy.[8] Thus, decision makers in firms experiencing a profit recovery will largely ignore future threats to a status-quo strategy and also information about outcomes in the past that are critical to this strategy. Furthermore agents will then disregard that the firm might have been radically transformed on several occasions in the past. The TTP also posits that a recent increase in profits will induce firm actors to make less

[8] What is more, in the TTP, the extended use of heuristic rules in periods of increasing profits will strengthen the preference for a status-quo alternative. The stronger priority by firm agents to current outcomes (see historical relativism and the peak-end rule) will e.g. reinforce an overconfident attitude to status quo among firm actors.

effort to enhance productivity notwithstanding the possible choice of a status-quo oriented transformation.

In the TTP the status-quo bias may be particularly strong if firms are experiencing exceptionally high profits. Firm agents following the peak-end rule put strong weight on record-high profits strengthening a status-quo bias in the TTP. What is more, the adherence to the peak-end rule *per se* and historical thinking may be exceptionally strong (as therefore the status-quo bias) in a profit boom. Overconfidence may also be particularly strong in a profit boom (in terms of Bayes's rule or a mental diagnosis) regardless of the *extended* use of heuristic decision rules focusing on current outcomes.

The psychological literature supports a hypothesis about a fundamental status-quo bias (see e.g. Karlsson et al., 2002 and Verplanken and Orbell, 2003). Some psychologists refer to people's priority to alternatives whose probabilities of outcomes can be estimated with certainty (ambiguity aversion); firms may have more knowledge about the probabilities of possible outcomes with a status-quo strategy than with other strategies. Furthermore, people may prefer a status-quo option with a sure but modest gain to avoid the disappointment of a large loss if they instead had chosen a risky alternative (see the regret theory). Firms may also be stuck to a safe status-quo option if they are risk averse and especially if they are loss averse, that is opponents of even a small loss (see the prospect

theory).[9] But the outcomes of a status-quo strategy are often difficult to predict and the choice of this strategy may be a risky venture. For example, static producers on monopoly markets face an obvious risk of product innovations by new firms. Thus there must be other arguments than predictability and safety for a status-quo tendency among firm actors.

A status-quo bias may reflect hyperbolic discounting. Firm actors might hesitate to pursue a transformation associated with a positive net present value if they are overwhelmed by the short-term sacrifices and displeasures when approaching the day of action.[10] The psychological literature also posits that the preference for status quo can emanate from habitual behavior. Habits are possibly developed through repetitive behavior, but they can be seen as a specific mental state (Verplanken and Orbell, 2003) or as a propensity to adapt in a particular way in a particular class of situations (Hodgson, 2004). In both perspectives people's choice of status-quo is not necessarily irrational. For example, firms might have developed industry-specific competences on the basis of learning by doing. But the choice of the status quo on habitual grounds may reflect the use of heuristic decision rules or pure conservatism. In these cases

[9] Examples of ambiguity aversion and minimization of regret challenge the axiom of cancellation (independency). Furthermore loss aversion (through framing effects) in the prospect theory challenges the axiom of invariance in the utility-maximization model.

[10] Hyperbolic discounting challenges the axiom of time-consistent preferences in the maximization-utility model (see, for example, O'Donogue and Rabin, 1999 and Angeletos et al., 2001).

repetition has molded a psychological state where a resistance to change is automatic and emotional, i.e. not the result of intentional calculation free from strong passions.

A status-quo bias can also be explained by indecisiveness. A postponement of transformation and also of investments *per se* to attain more information may be rational (see Dixit and Pindyck, 1994). However, to meet inevitable threats in the future, firms should eventually, notwithstanding the lack of complete knowledge about the extent and nature of possible challenges (and their probabilities), abandon a status-quo position. Keynes referred to Buridan's ass. The animal starved to death since it was unable to make a choice between two stacks of hay on 'rational' grounds. Keynes maintained that people must, and will indeed, make decisions despite a low weight of evidence, decisions that are based on habit, instinct and affection (Keynes, 1979 [1938], p. 294), see also Keynes, 1936, pp. 161-163). By referring to habits, Keynes provided arguments for a status-quo bias in investment decisions. But indecisiveness *per se* can explain why firms have a tendency to make investments along the lines of a status-quo preserving strategy. Indecisiveness may reflect a major affective deficit in rational calculation (Camerer et al., 2005, p. 29) or a stalemate between parallel mental processes (Spiegler, 2008, p. 518).

The TTP supports the idea in the psychological literature that people have a *confirmatory bias* (myside bias). They will collect, process and interpret information in a way that confirms an initial choice or opinion. People (including experts) are often too confident in their initial option in the eyes of a Bayesian statistical observer. They will overreact to information verifying the chosen alternative and underreact to data rejecting it. A few observations on profits may lead to overconfidence among firm agents in a chosen strategy given a confirmatory bias (cf. Rabin and Schrag, 1999; Suen, 2004; Stanovich and West, 2006). The TTP assumes that a status-quo bias is fundamental for a confirmatory bias. But it also claims that a preference for status quo might actually have been created by an increase in profits in the short run. Furthermore the theory of transformation pressure maintains that even a weak signal, for example a profit decline of an indefinite character, may induce firms to abandon a status-quo alternative.[11]

3.2 Abandoning the status quo in a recession

A sudden decrease in actual profits may mitigate and even remove a status-quo bias based on people's aversion to ambiguity, regret and losses. A status quo option was not as predictable or free from unfavorable outcomes as the firm

[11] Rabin and Schrag (1999) emphasizes that overconfidence can be long-lived and even strengthened over time if agents are subject to serious confirmatory bias or if the signals (information) are ambiguous (given a confirmatory bias). Thus this approach takes a confirmatory bias for given. Furthermore it does not discriminate between information about actual and expected outcomes. Finally, in Rabin and Schrag's model, a weak signal is not enough, as in the TTP, to induce agents to change opinion or strategy.

agents had expected. Furthermore, a profit decline will probably weaken the support to a status-quo strategy given a confirmatory bias, thus overconfidence in this strategy is reduced in light of Bayesian statistics. But the TTP emphasizes that a profit decline will reduce actor loyalty to status quo by impelling them to become more rational. Agents will e.g. meet an actual fall in profits by making stronger effort to foresee future challenges and more systematic studies of profits in the past. A decrease in profits after a period with a steady increase in profits may serve as an alarm clock for firm agents fearing a substantial reduction in profits and also that the survival of the firm is at stake.

There are three aspects on the increase in rational behavior after a reduction in current profits. First, a profit fall may cure indecisiveness and weaken a present-biased preference among decision makers. Second, it may reduce the influence of heuristic decision-making principles and conservative thinking. Thus the support to status quo will no longer, or to lesser degree, be based on (bad) habits, the peak-end rule and historical relativism. Third, a profit fall may weaken or eliminate the overconfidence favoring a status-quo option in the TTP. Firm agents will then take a more sober view of the firms' prospect in the future and cease to overestimate their competence and invulnerability. Overconfidence can also disappear after a decline in actual profits uncovering those doubts about investments, growth strategies and personal capabilities that firm agents had put in a subconscious mental department during the previous recovery.

Thus, the TTP maintains that firm agents become (more) rational after an actual decline in profits and that the associated weakening or disappearance of present-biased preferences, indecisiveness, overconfidence and heuristic behavior will reduce the support to a status-quo option. (It *is* possible that more rational actors would still prefer a status-quo option.) However, the TTP comprises the possibility that firm actors will underreact to an actual decline in profits. The profit fall may not be strong enough to eliminate overconfidence in the eyes of a Bayesian observer (see Rabin and Schrag, 1999) or in terms of a mental distortion (intoxication, haughtiness or repression). What is more, firms may perhaps have to face a substantial or long-lasting external challenge to combat the destructive forces of bad habits, indecisiveness and present-biased preferences. However, in the TTP, the departure from status quo after a decline in actual profits can reflect that agents are *overreacting* (cf. Massey and Wu, 2005). Managers and owners still governed by the peak-end rule and historical relativism are too anxious to quit a status-quo position after a profit fall. For example, they will confuse a (temporary) recession with a long-run challenge to the firm. A profit decline may also change the attitudes to status quo from overconfidence to underconfidence. Agents who earlier had been self-deceptive about their own judgments and capabilities will not become more sober and self-knowing but instead be seized with panic and feelings of inferiority (suffering from lower self-esteem) leading to too weak confidence in 'business as usual'.

A special version of the TTP states that firms react quicker to a profit decline by abandoning a status-quo alternative if profits have previously approached record levels. First, firms that will only chose a status-quo alternative in a profit boom have probably a weaker confirmatory bias than other firms. Accordingly the share of firms with relatively weak confirmatory bias towards the status quo is larger in a boom. Second, exceptionally strong confidence in status quo through intoxication, haughtiness and repression during a profit boom may turn to its opposite in the following recession. Furthermore firms' overreaction to a decrease in profits may be exceptionally strong after a profit boom through the lingering influence of pronounced ahistorical thinking. It *may* be argued that firms in general are more overconfident about a status-quo option after a profit boom (according to either Bayes's rule or a mental diagnosis) resulting in serious underreaction to a fall in actual profits. The TTP does not exclude that firms must experience a strong decline in profits to abandon a status-quo option (with or without transformation) if they had already made this choice before the profit recovery had turned to a profit boom. However, the tendency to underreaction is not supposed to be strong enough to challenge the conclusion that firms will generally react more strongly by transformation if a profit decline was preceded by a profit boom.

4. The psychology of Schumpeterian economics

There are some similarities between the TTP and Schumpeter's theory of the business cycle. Schumpeter provided room for overinvestments (malinvestments) through overconfidence. In prosperity established firms expect that the price increases elicited by the expansion of innovative firms (entrepreneurs) will continue (Schumpeter, 1939, pp. 140, 146, 148). But when an innovation cycle comes to an end prices will cease to increase changing the mood of firm agents from overconfidence to underconfidence (notions that were not used by Schumpeter). Furthermore, Schumpeter suggested that the expansion of established firms in the prosperity phase will favor a status-quo oriented growth strategy – 'business will borrow merely to expand on old lines' (Schumpeter, 1939, p. 144). Finally, in both the TTP and Schumpeter's theory, some firms are hit by 'creative destruction' due to innovations by other firms leading to (external) structural change (Schumpeter, 1976 [1943], pp. 83-84).

Yet there are differences between Schumpeter's theory of the business cycle and the corresponding TTP. In Schumpeter's *Business Cycles*, the prosperity phase is formed by the innovations by new firms even if these innovations can be spread in the recession or depression. It is true that innovations are basically exogenous (determined by sociological factors) in *Business Cycles*. But in his analysis of innovation clusters in prosperity Schumpeter shed light on positive driving forces, mainly new technological opportunities. Furthermore Schumpeter emphasized in

Business Cycles that the recession/depression will not lay the ground for the following revival and prosperity by enforcing innovations or productivity changes in the firms.[12] On the contrary, reductions in production costs and interest rates, thus positive driving forces, might lead the economy out of a depression (Schumpeter, 1939, 139 n1, 152, 154). By underlying the importance of R&D investments under big-business conditions Schumpeter focused even more on positive driving forces in *Capitalism, Socialism and Democracy* though he underlined here the long-run perspective and stability rather than the scale and financial advantages of large companies (Schumpeter (1976 [1943], pp. 101-103). Schumpeter used the notion of creative destruction in *Capitalism, Socialism and Democracy* to shed light on the *consequences*, not the driving forces, of innovations.[13]

The growth-enhancing role of positive driving forces, primarily financial factors and scale advantages in R&D, is underlined in the neo-Schumpeterian literature.[14] In the Nelson-Winter model of virtuous growth circles initial

[12] Schumpeter (1939, pp. 139, 143, 150, 155).

[13] In fact Schumpeter emphasized that frequent bankruptcies under competitive conditions would, by intensifying irregularities and disequilibrium tendencies, have a negative effect on innovations (Schumpeter, 1976 [1943], pp. 90-91, 95 and 104-105).

[14] In their industrial analysis neo-Schumpeterian economists first emphasized that strong competitive pressure would hamper the profit incentives and financial opportunities to make R&D investments and the possibilities to exploit scale advantages in R&D (see Scherer and Ross, 1990, pp. 637, 643 and Scherer, 1992, p. 1420). Even today many neo-Schumpeterian economists conform to Schumpeter's view by considering innovations as exogenous or by emphasizing the importance of positive driving forces (favorable financial conditions, learning effects, knowledge spillover effects, etc.) and the consequences of innovations for structural change and economic growth (see Hanusch and Pyka, 2007).

innovation profits will lead to new innovations by facilitating R&D spending. The importance of positive driving forces is accentuated on the macroeconomic level by the assumption that innovations by leading firms are gradually imitated by other firms (see Nelson and Winter, 1978, pp. 525-541 and Nelson, 1995, pp. 68-72). Neoclassical (endogenous-growth) theorists inspired by Schumpeter's notion of creative destruction have argued that a countercyclical productivity pattern could emerge through variations in the elimination of inefficient production units and also in R&D investments and the use of production slacks. But the tendency to countercyclical R&D investments in these growth theories does not reflect any changes in external pressure (through procyclical profits) as in the TTP but in resources available for R&D activities. Furthermore, this tendency is offset by the procyclical development in firms' ability to self-finance R&D investments (Aghion and Howitt, 1998, 239-243; Malley and Muscatelli, 1999, p. 340; Barlevy, 2004).[15]

Neither Schumpeter nor economists in the Schumpeterian tradition have emphasized the importance of psychological factors in the analysis of economic progress. However we will seize upon that positive driving forces are emphasized in the Schumpeterian tradition and that some economists in this tradition actually

[15] There is, however, a growing support in growth economics to the hypothesis that more intense foreign and domestic competition will enhance productivity by putting a stronger pressure on firms and industries to be more efficient and innovative (Trindade, 2008). Neoclassical economists influenced by Schumpeter's notion of creative destruction have recently referred to the positive effects of harder competition (e,g. through entry) on innovations by incumbent firms close to the technological frontier (see Aghion et al., 2009).

refer to psychology when distinguishing the factors behind R&D investments and industrial renewal. Two Swedish economists heavily influenced by Schumpeter, Johan Åkerman and Erik Dahmén, stressed that time perspectives are lengthened in a recovery, favoring R&D and other long-sighted investments, and then shortened in a recession having a negative effect on these investments. Åkerman referred to variations in subjective discount rates but primarily to overoptimism (overconfidence) and extensive risk taking (by firms and banks) in a recovery and to overpessimism and risk aversion in a recession or depression (see Åkerman, 1960, 142-143 and Erixon, 2011).

We will attribute two hypotheses to Schumpeterian economics of which one is compatible with the TTP – firm agents will be overconfident when profits are increasing in the short run leading to overinvestments. The other Schumpeterian hypothesis says, in conflict with the TTP (and actually with Schumpeter's view in *Business Cycles*) that overconfident and risk-prone agents will prioritize radical transformation in good times. Thus the Schumpeterian theory is satisfied if firms would radically transform in periods of increasing actual profits. Accordingly, Furthermore, a sudden decline in profits makes agents underconfident and risk avert favoring a status-quo option without any transformation at all or actions to increase productivity along the lines of a status-quo strategy. Thus firms that have chosen radical transformation in a recovery would follow a status-quo oriented growth trajectory after an actual fall in profits. Schumpeterian

economics will also be connected with the hypothesis that total factor productivity growth within firms moves cyclically by psychological reasons.

5. The experimental role play

The prime aim of the role play was to examine the validity of the hypotheses about investments and strategy choices and the underlying psychological mechanisms in the TTP. Some of the alternatives in a choice set were compatible with the TTP, other alternatives were not. The role play had also the ambition to compare the hypotheses about strategy choices in the TTP with those in Schumpeterian economics.

Figure 1 summarizes the chosen strategies in the TTP when the firms are experiencing first an increase in profits during a couple of years and then a sudden decline in profits. Figure 2 presents the strategy choices in the special cases of the theory; it is possible to draw a decision tree reproducing the choices in a profit recovery, profit boom and in the periods of a modest and substantial decrease in actual profits (where the previous increase in profits is used as a standard). The strategies in Schumpeterian economics are surveyed by figure 3.

Figure 1: Strategy choices in the theory of transformation pressure – the general case

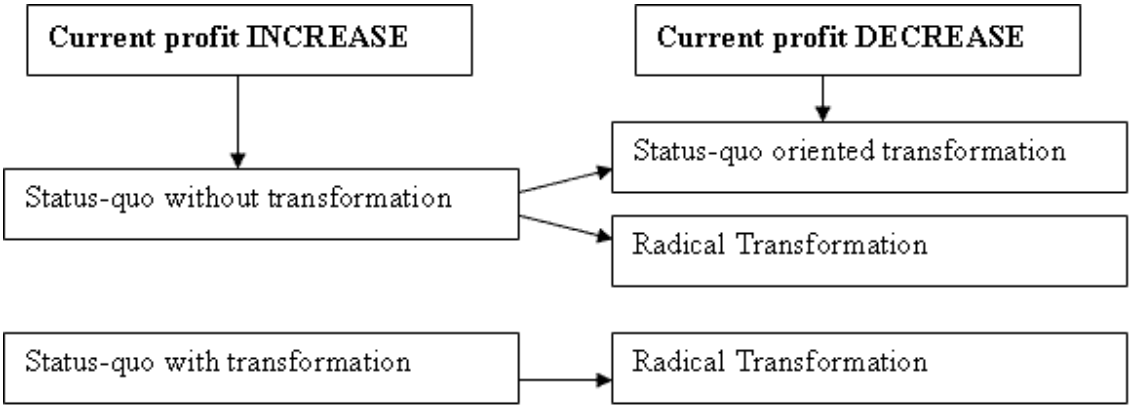
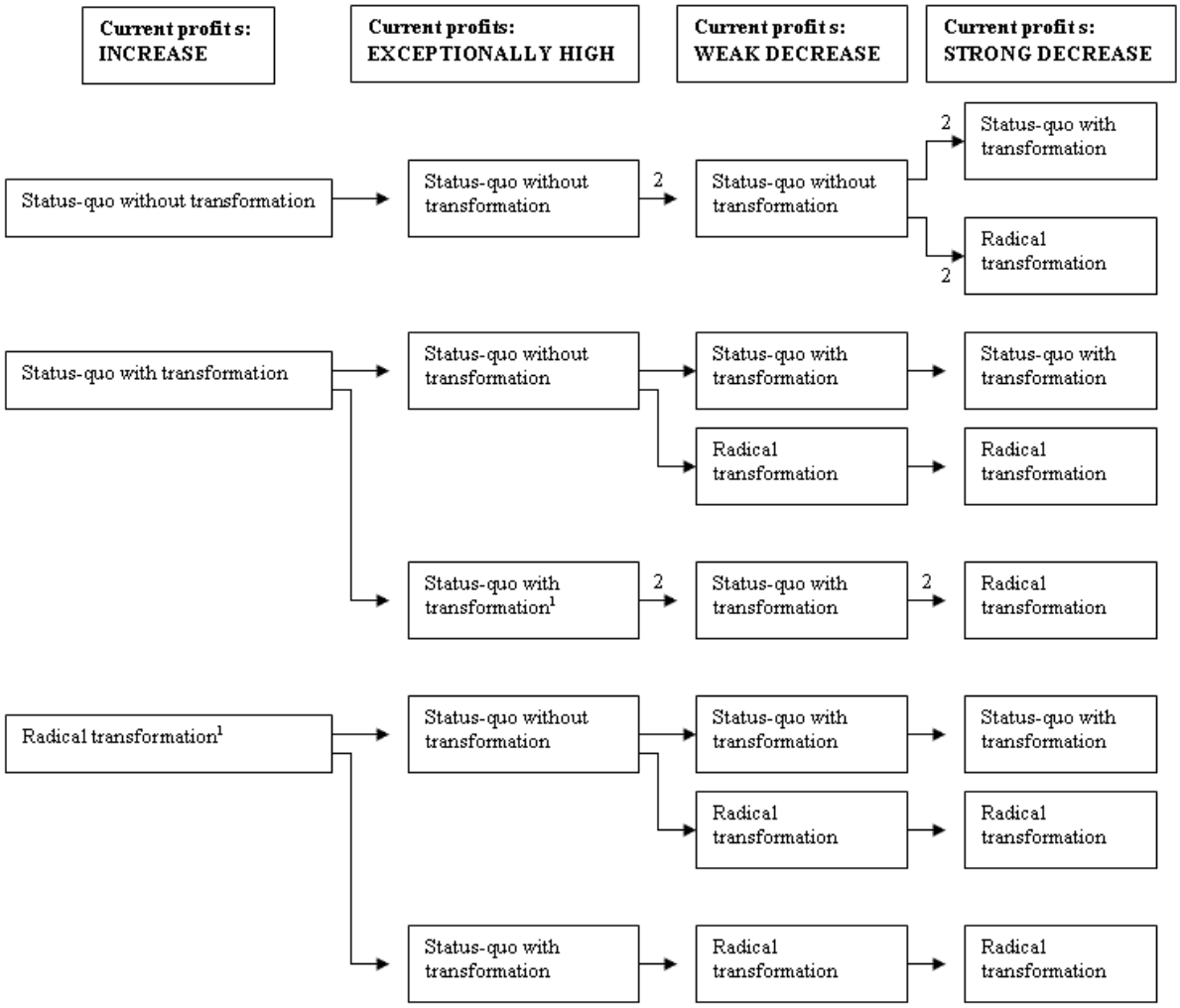


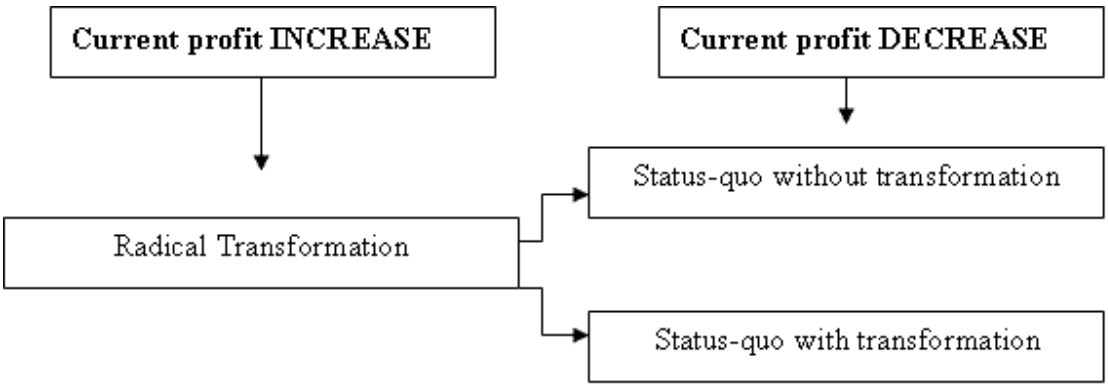
Figure 2: Strategy choices in the theory of transformation pressure – the special cases



[1] The TTP does not exclude that *some* firms choose radical transformation in periods of increasing profits or that *some* firms will hold on to a status-quo oriented transformation also in a profit boom.

[2] A hypothesis that firms that choose the same strategy during a normal increase in profits and in a profit boom need a substantial decrease in profits to transform is not a necessary condition in the TTP.

Figure 3: Strategy choices - Schumpeterian economics



The 85 students enrolled in the experimental role play were first-year students in Economics at Stockholm University. Before the role game the students had followed lectures, participated in exercises and conducted an examination on the basic IS-LM model in macroeconomics. In this model private investments are a function of the rate of interest and of GDP (the accelerator). Before the role play the students had also had attended lectures on how investments are determined outside the basic IS-LM model. Private investments are a function here of the gross present value - determined primarily by expected profits and interest rates - and the investment costs. The present-value approach is only theoretically exclusive if combined with an assumption of how expectations are formed. For example, expectations are basically determined by forward-looking agents in the theory of rational expectations and by current profits in the TTP.

The students were asked to complete an anonymous questionnaire with nine questions about their investments and strategy choices under varying external circumstances and about the underlying motifs and psychological processes (see Appendix). They were instructed, both verbally and in the questionnaire, to use their imagination and make endeavors to identify themselves with the manager of an established company (a company older than 20 years). The participants in the role play were asked *not* to be governed by their guesses about what they were expected to reply according to the macroeconomic textbook *or* the experimentalists. The students should only try to imagine which choices they would have made as managers and describe their view of why they acted in the way they did. They were not under time pressure when completing the questionnaire. They participated in the experiment during a break for twenty minutes in the middle of a lecture.

The students should give one answer only to each question. When asked about their strategy decisions the participants could choose between a status-quo strategy without transformation, a status-quo option with transformation and a radical transformation. The design of the questions about strategies made it possible to reproduce a sequential process for each student formed by his or her reaction to variations in expected and actual profits. When describing the underlying incentives and psychological mechanisms the students could choose

between a large number of options. The formulation of the alternatives was based on the psychological explanations in the TTP but also on other psychological inferences and on theories about rational behavior.

Attempts were made in the questionnaire to avoid a bias for theories challenging the axiom of rational behavior. The set of answers provided large room for the propositions of basic (text-book) macroeconomics and for rational behavior in general. For example, when asked about the effects on investments of an increase in profits in the short run, the participants were informed that a similar increase in profits for other companies was not excluded. In the theory of rational expectations firms will not expand if they know that the increase in profits is general. In fact, the provision of the 'correct' text-book answers and of information favoring theories of rational behavior and the obvious risk that the participants would act more rational in fantasy than in reality suggest that our role play had a rational bias. In fact, the questionnaire was consciously framed to reduce the risk of a bias of an opposite type. However our panel approach made it possible to disentangle whether the choices by the students fulfilled the criteria of consistency.

6. The questionnaire

6.1 Question 1

The students acting as managers for an established company were asked to reveal their investment decisions in a situation with increasing actual profits (the rate of return on equity) in the short run, thus during this year and the previous two-three years. One of alternatives confirmed the TTP and the Schumpeterian theories – a previous increase in profits will stimulate investments by having a positive effect on expectations of future profits (alternative a).

Other alternatives were compatible with the basic macroeconomic model (the accelerator, alternative b) and with a general version of the rational theory of forwards-looking expectations (alternative f). Two alternatives were meant to cover specific versions of the theory of forward-looking expectations - firms will increase investments after an increase in actual profits by expectations of harder competitive pressure (alternative c) or of higher demand (alternative d), see the possibility that other companies, including competitors, could have experienced a similar increase in profits. Furthermore, the students had the opportunity to select answers in accordance with the rational theories of adaptive learning and investment under uncertainty (alternative e and g). In these theories investments will not necessary be stimulated by higher profits during a couple of years - investments are a function of profits during a long historical period or postponed to distinguish whether the profit increase is temporary or sustainable.

6.2 Question 2

The second question was only directed to students who had replied that increasing profits in the short run, by having a positive effect on expectations, made them inclined to increase investments (see Question 1). The students had e.g. the chance to reply that a steady increase in profits made them ahistorical, see historical relativism (alternative a). They could also choose among the three forms of overconfidence – loss of judgment ability, haughtiness and suppression of personal doubts (alternative b, c and d). Furthermore the students could proclaim that they were influenced by the optimism flourishing among firms in an economy with increasing profits (alternative e). This social-psychological mechanism is not associated with the TTP theory.

6.3 Question 3-5

The following questions focused on the students' strategy choices in a period of increasing profits. The students were first asked whether a profit boost would induce them to choose a status-quo strategy without transformation, a status-quo strategy with transformation or a radical transformation (see Question 3, alternative a, b and c)). The TTP was confirmed if the majority of the students preferred one of the status-quo alternatives and the Schumpeterian view if they chose radical transformation.

The subsequent question (Question 4) was only addressed to students who had declared that they would follow a status-quo strategy in times of increasing profits in the short run. Playing the role of managers the students were asked to describe the motifs and mental states underlying their choice of a status-quo option. Four of the five alternatives were meant to represent the psychological explanations of the TTP – increasing profits will reinforce historical relativism or lead to overconfidence through intoxication, haughtiness and suppression of doubts (alternative a, b, c and d). The fifth alternative was compatible with a theory of enforced rationality – the increase in profits induced firm agents to abandon a state of underconfidence developed during an earlier period of falling profits (alternative e). The TTP theory does not exclude the working of a similar psychological mechanism in periods of increasing profits. But the theory assumes that it will be superseded by the tendency to overconfidence provided that the profit increase continues over several years.

The students were also asked about their strategy choices in a situation where short-run profits approached record levels (see Question 5). The answer alternatives were the same as in the case of a profit increase in general (see alternative a, b and c). A special case of the TTP maintains that firms' reluctance to transformation is particularly strong if profit soars to record levels. Therefore, students who chose radical transformation during a period with increasing profits in general (see Question 3) were expected to make no transformation at all or a

status-quo oriented transformation during a profit boom. And students who chose a status-quo oriented transformation during a period of rising profits in general (see Question 3 again) were supposed to choose no transformation at all during a profit boom.

6.4 Question 6-9

The remaining questions concerned the strategy decisions by firms when the period of increasing actual profits had come to an end. The students were first asked about their reaction to news that their firm was facing a risk of a substantial decline in profits in the future (Question 6). The students could switch from a status-quo strategy without transformation to a status-quo strategy with transformation (alternative a) or from any of these status-quo options to a radical transformation (alternative b). They had also a third alternative – they could postpone a strategy change until the firm really experienced an actual decline in profits (alternative c). The last alternative conforms to the TTP.

The next question (Question 7) should only be answered by students who had declared that they would not change strategy until the firm experienced an actual decline in profits. The students had the opportunity to answer that a decline in actual profits was necessary to persuade them to abandon their (heuristic) propensity to only consider current outcomes, see historical relativism

and the peak-end rule (alternative d). They had also the chance to reply that the actual decline in profits made them less overconfident in terms of intoxication, haughtiness or repression (alternative b, c and e). Alternatively the students could unveil a propensity to overreact to an actual decline in profits (alternative f).

The choice of any of these alternatives of enforced rational behavior and overreaction to an actual reduction in profits was compatible with the TTP. But the students had also the opportunity to choose an alternative in line with the option theory of investment under risk (alternative a). The 'rational' student could answer that he or she postponed transformation until the profit decline was real in order to increase the weight of evidence; observations of real outcomes would increase knowledge about the true character and scope of external threats.

The students were also asked about their strategy response as managers to a decline in actual profits in one year after a period with an increase in profits (see Question 8). The ambition behind this formulation of the question was to make clear that the firms are hit by a negative external shock. Thus, all students should answer the question whatever their reply to the previous question on their reaction to information that that there is a risk of a substantial decline in profits in the future (see Question 6). As usual, the students could choose

between a status-quo strategy, with or without transformation, and a radical transformation. The TTP was verified if the majority of students reacted to the sudden decline in profits by choosing a transformation option. However, to fully confirm the TTP, the students must prefer a status-quo oriented transformation or a radical transformation if they had chosen a pure status-quo strategy during the previous period with a profit increase. And they must give priority to radical transformation if they had opted for a status-quo shaped transformation during the preceding profit recovery (see Question 3).

The Schumpeterian theory was confirmed if the majority of students reacted to the actual reduction in profits by choosing one of the status-quo options. But a necessary condition for the validity of the Schumpeterian theory is that the students must shift from radical transformation in the profit recovery (see Question 3) to a status-quo option after the profit fall.

The final question (Question 9) was only posed to students who chose a transformation alternative after a sudden decline in profits. The students were asked to specify whether the profit decline must be of equal size as the previous increase in profits during a period of the same length (here one year) or if it could be small in relation to the previous increase in profits (alternative a and b). The aim of this question was to test the hypothesis in the special version of the TTP that firms that only chose a status-quo option in a profit boom are less

confident in this alternative. These students were supposed to change strategy already after a modest decline in actual profits. More precisely, students/managers who chose a status-quo strategy without transformation during a profit boom but not during a 'normal' profit increase (see Question 3 and 5) must change to a radical or status-quo oriented strategy already after a small decline profits. And students/managers who chose a status-quo oriented transformation instead of a radical transformation during a profit boom but not during a 'normal' profit increase (se Question 3 and 5 again) must react by changing to radical transformation already after a modest decline in profits.

Another object of the last question was to find out whether the students reacted slowly to a profit decline because of exceptional overconfidence in status-quo. A possibility in the special version of the TTP is that firms choosing a status-quo strategy with or without transformation in a profit boom and also during the period of a 'normal' profit increase (see Question 3 and 5) will only transform after a substantial decrease in profits. More precisely, firms that chose a status-quo strategy without transformation during a profit boom and also during a period of a 'normal' profit increase will only decide to follow a transformation strategy (possibly radical) after a substantial decrease in profits. And firms that chose a status-quo strategy with transformation during a profit boom and also during the period of a 'normal' profit increase (see Question 3 and 5 again) will only radically transform after a substantial reduction in profits.

6.5 The test of inconsistency

A central idea in the TTP is that firm agents who are generally governed by heuristic rules and strong emotions will first become (more) rational after an actual decline in profits. From the opposite viewpoint agents are rational all the time; a postponement of transformation until the day of an actual reduction in profits is explained here without any references to a new mental state or behavioral rule. But the answer to one question indicating a consistent rational behavior by the students may be contradicted by their answers to another question. We tested a hypothesis about inconsistent rational behavior by comparing the answers by each student. Our ambition was to find out whether we can answer in the affirmative to the following six questions:

1. Did the student declare that they have chosen a status-quo strategy in a profit recovery on rational grounds (Question 4, alternative e) despite the fact that they had made investments on the basis of a small number of observations in a recovery (Question 1, alternative a)?

2. Did the students refer to irrational motifs for their choice of a status-quo strategy in a profit recovery (Question 4, alternative a, b, c or d) despite the fact that they had made investments on rational grounds in a recovery (Question 1, alternative e, f or g)?

3. Did the students declare that they transformed the firm first after an actual decline in profits on consistently rational grounds (Question 7, alternative a) despite the fact that they had referred to irrational driving

forces behind their decision not to transform the firm in the recovery (Question 4, alternative a, b, c or d)?

4. Did the students reply that they had transformed the firm first after an actual decline in profits on consistently rational grounds (Question 7, alternative a) despite the fact that that they had made investments on the basis of a small number of observations in a recovery (Question 1, alternative a)?

5. Did the students' propensity to transform the firm first after an actual decline in profits reflect that they had become more rational (Question 7, alternative b, c, d or e) despite the fact that they have chosen a status-quo strategy in a profit recovery on rational grounds (Question 4, alternative e)?

6. Did the students' propensity to transform the firm first after an actual decline in profits reflect that they had become more rational (Question 7, alternative b, c, d or e) despite the fact that they had invested on rational grounds in a recovery (Question 1, alternative e, f or g)?

Hence, our test of inconsistency focused on two issues. First, we analyzed whether the students made rational decisions on investments but referred to irrational motifs for their strategy choices in a recovery. Second, we checked whether the students had declared that they acted as consistent rational agents when deciding not to transform the firm until an actual decline in profits but made irrational choices and referred to irrational motifs for their behavior in the

previous recovery. The results from the test of inconsistency are presented in a separate section below.

7. The results[16]

The results from the role play on investments are not fully conclusive, but they confirm to a great extent the TTP and Schumpeterian hypothesis that firms will overreact to a short-run increase in profits (see Question 1). 27 per cent of the students answered that the profit increase, by having a positive effect on expectations, would increase their investments. This proportion was significant on 1 % significance level. With seven alternatives, the probability of choosing the 'overinvestment' hypothesis by chance was 14 per cent (1/7) given independence between the alternatives. In fact, the frequency of this answer was higher than for all other answers. The significance and strength of the overinvestment alternative is noteworthy considering that the students had the opportunity to choose text-book alternatives including the rational ones. If the rational alternatives of forward-looking expectations, rational adoption and investment under waiting are lumped together the overinvestment alternative is *not* significant at 5 % level. But the frequency of these rational answers is not harmful for the overinvestment hypothesis *per se*. Overinvestment is a possible reinforcing phenomenon allowing the dominance of rational responses to a short-

[16] Complete information about the dataset and the statistical tests can be attained from the authors.

run increase in profits. Besides, the overinvestment alternative had a p-value that was only marginally higher than the critical value of 10 %.

The students who had chosen the overinvestment option should then describe the underlying psychological mechanism (see Question 2). A contention that the profit increase made them ahistorical was the most common answer (1/3) without being significant. However the proportion of students who had selected any of the psychological mechanisms in the TTP (16 of 22 students) was significant at 10 % level (given the expected proportion of 50 %). Thus, the share for the psychological alternative *not* associated with the TTP – higher short-run profits will create euphoric feelings in the economy – was insignificant.

The students supported the TTP by demonstrating a strong propensity to choose a status-quo option in periods of a rise in profits (Question 3). The total share for the status-quo options – 86 per cent (73 out of 85 students) – is significant at 1 % level. The Schumpeterian choice of radical transformation was not frequent enough to be significant.[17] On the other hand, more students opted for radical transformation than for a status-quo position without transformation (12 and 8 students respectively). The weak preferences for a pure status-quo strategy are certainly unfavorable, though not a blow, to the TTP.

[17] However the Schumpeterian hypothesis is more difficult to verify than the TTP hypothesis allowing people to choose between two alternatives.

A relatively low number of those students who chose a status-quo strategy in times of increasing profits declared that they had been governed by the psychological mechanism emphasized in the TTP (Question 4). The proportion of these answers was not even significant after rejecting the assumption of independence between the alternatives. In this case, the frequencies of overconfidence, haughtiness and repression were added (resulting in an expected value of 50 per cent) and then compared to the frequency of the only remaining alternative – the increase in profits induced the students to switch from underconfidence to rationality.

The role play did not confirm a specific version of TTP emphasizing that firms are exceptionally status-quo minded in a profit boom. The proportions of students choosing a status-quo option was *not* significantly higher if their firms were experiencing record levels of profits instead of a profit increase in general (see Question 5). Neither did the role play confirm that students who have opted for radical transformation in a period with a profit increase in general (see Question 3) chose one of the status-quo options in a profit boom. In fact the number of students who switched to a status-quo option in the profit boom (7 students) was only marginally higher than the number of students who continued with radical transformation (5 students); the difference was not significant. Furthermore, a minor share of the students (2 of 65 students) changed from a

status-quo option with transformation to a pure status-quo alternative when profits approached record levels (the proportion was far from significant.)

The majority of students declared that they would react to information about a substantial decrease in profits *in the future* by changing to either a status-quo oriented or radical transformation (Question 6). 30 % of the students chose the alternative representing the TTP – firms will not react until the profit decline is manifest. This share is significantly less than the expected 50 %. Thus the role play was unable to confirm the TTP theory that firms will first react by transformation after an actual decline in profits. But the risk for a rational bias is obvious in this case. The small number of alternatives made it easy to distinguish the 'correct' answers. Furthermore, the number of students who behaved in line with the TTP (26 students) was approximately equal to the number of students who answered that they would react to expected threats in the future by switching from a status-quo strategy without transformation to one with transformation (25 students).

The psychological explanations for why firms will only react to an actual decline in profits were not confirmed by our role play (see Question 7). 4 of the 26 students who had declared that they would first react to an actual reduction in profits chose one of the psychological alternatives (see Question 6). 22 students answered in line with the option theory of investment under risk that they first

reacted when the profit fall was real to get a clearer picture of the character and scope of the decline. The difference between these 'rational' answers and the other answers was significant.[18]

The role play confirmed that firms will choose transformation in a period of an actual decline in profits (Question 8). In fact 77 of the 85 students preferred one of the transformation alternatives. This result is significant assuming that the real alternatives were transformation or not transformation. It is also significant with the assumption that the transformation alternatives were randomly distributed (implying an expected probability of 2/3). The fact that only 24 students chose radical transformation after an actual decline in profits does not reject the TTP. But the arguments for the TTP would definitely have been stronger with a higher share for this radical alternative.

The role play supported the hypothesis in the TTP that firms that had chosen a pure status-quo strategy during the period of a profit increase would transform when they then faced a decrease in profits. A significant proportion (88 %) of the students who had preferred this status-quo alternative in the profit recovery decided to pursue a transformation. (The expected proportion was 50 %.) Fair to say, however, the number of students who had chosen a status-quo position without any transformation during the profit recovery was small (8 students).

[18] The proportion of 'rational´students was statistically significant at 1 % level with an expected proportion of 50 % by chance.

Moreover, the role play did not endorse the pertinent hypothesis in the TTP that firms that had chosen a status-quo oriented growth strategy during the upswing in profits turned to a radical transformation in the subsequent period of falling profits. Only 16 out of 65 students made this change of strategy. We conclude, though with reservations, that the role play has confirmed the hypothesis in the TTP that firms will switch to a transformation strategy when profits are actually falling.

The Schumpeterian theory requiring that a majority of the students should meet a profit decline by opting for a status-quo alternative was confirmed by the role play. The popularity of a status-quo oriented transformation explains why both the TTP and the Schumpeterian theory were confirmed in this case of a profit decline. However the role play did not confirm the Schumpeterian hypothesis that firms switched from radical transformation to a status-quo option when the period of increasing profits was replaced by a period with falling profits. 7 of 12 students who had opted for radical transformation in the profit recovery did change strategy. This share was not significant with an expected share of 50 % (the p-value was 0.77).

The hypothesis in the specified TTP that firms will react even to a minor decline by transformation if they had first switched to a status-quo alternative in a profit boom was hardly confirmed (Question 9). An insignificant proportion of students

who had only opted for a pure status-quo alternative in a profit boom declared that they would respond even to a small decrease in profits by transformation (see also Question 3 and 5). On the other hand, a significant proportion of students who had only chosen a status-quo oriented transformation (instead of a radical transformation) in a profit boom answered that they would react to even a small reduction in profits by radical transformation (4 of 5 students). But it is difficult to draw any real conclusions in this case due to the low number of students who had changed strategy in the profit recovery. By also taking account of the students' weak propensity to be more status-quo oriented in a profit boom (than during a 'normal' increase in profits) the role play has provided weak arguments for the specific TTP.

The role play was unable to clearly display that a strong decrease in profits was needed to enforce firms that chose a status-quo strategy both during a profit increase in general and during a profit boom to transform (Question 9). The majority of the students who preferred a pure status-quo strategy in both cases of an upswing in profits needed a substantial decrease in profits to transform (see also Question 3 and 5). But the number of students who chose a pure status-quo strategy during both a 'normal' profit increase and a profit boom was very small (5 students). Furthermore a minority of the students who chose a status-quo oriented transformation in both recovery cases answered that they would only make a radical transformation after a substantial decrease in profits

(25 of 52 students). However the difficulties to unambiguously confirm the hypothesis that a substantial decline in profits is required to overcome too strong confidence in status quo are not critical for the TTP. The hypothesis is not a necessary condition for the validity of the theory.

Let us finally present the results from the test of inconsistency. The students obviously made an inconsistent choice in one of the six cases, case 4. Eight of the nine students who had had made investments on the basis of a small number of observations in a recovery and then reacted first on an actual decline in profits declared that their late reaction reflected a wish to attain more information about external challenges (see Question 7, alternative a). This proportion was statistically significant on 1 % level even with the assumption of independent alternatives (thus with the expected proportion of 50 %). There are also indications of an inconsistent behavior in case 2. 12 of the 39 students who had admitted that they were under the influence of one of the irrational (psychological) forces in the TTP when choosing strategy in a recession simultaneously declared that their investments were governed by rational considerations. This share was significant on 5 % level given an expected share of 50 %. But there were no indications of inconsistent behavior in four of the six cases, especially not in case 5 and 6.

Thus, our study provides weak support to a hypothesis that the students who expressed a consistent rational attitude when answering one question contradicted themselves when answering other questions. The lack of strong evidence of inconsistent behavior in four of the six cases is striking. However, the low number of students in many cases (mostly less than ten) prevents more definite conclusions about the degree of consistency in our role play.

8. Conclusions and comments

Today psychological concepts are common in financial economics but not in the analysis of the business cycle and economic growth. This paper has focused on firm behavior and the underlying psychological mechanisms in the theory of transformation pressure (TTP). By emphasizing the pivotal role of negative driving forces the theory suggests that productivity growth within firms is obstructed by increasing actual profits and accordingly moves countercyclically. This view of the relationship between profits and productivity has correspondences in the literature on bounded rationality. But the psychological approach of the TTP makes it possible to formulate and anchor a hypothesis that firms' decision on productivity is based on current profits. People's priority to current outcomes is emphasized in the (economic) psychological literature about heuristic decision making, see the peak-end rule and historical relativism. The TTP also maintains that increasing profits make firm agents overconfident. Furthermore, in the TTP, a current increase in profits would induce firm agents

to opt for a status-quo oriented growth strategy. The psychological literature underlines that people have a status-quo bias, e.g., by following the heuristic principle of habits. When arguing for the hypothesis that more rational firms will escape a status-quo oriented strategy in periods of falling profits, the TTP refers to the abandoning of overconfidence and heuristic decision making. Finally, the theory uses psychological concepts to explain why firms might either overreact or underreact to a profit decline.

In Schumpeterian economics, positive driving forces are decisive for innovation and productivity growth. The Schumpeterian tradition sheds light on the importance of technological and financial opportunities and learning (in both production and R&D activities) for innovations. But it also refers to the positive effects of overoptimism and excessive risk taking on R&D investments in a recovery. Strong transformation pressure can actually interrupt those virtuous growth circles that are highlighted by Schumpeterian economists. But it may also prevent that a path-depending cumulative process leads to industrial locking-in effects.

A class of undergraduate students in economics at Stockholm University participated in a role play where they were asked to act as managers for an established company. The role play aimed at testing the hypotheses about investments, growth strategies and underlying psychological mechanisms in the

TTP. The questionnaire also provided room for answers in accordance with Schumpeterian economics and the neoclassical theory of rational behavior.

The role play supported the hypothesis in the TTP, and also in Schumpeterian economics, about overinvestment in periods of increasing profits. The participants emphasized that they were governed by ahistorical thinking. The role play also confirmed the hypotheses in the TTP that firms have a preference for status quo in a profit recovery and, although not consistently, for transformation after a negative profit shock. The experiment did not verify the Schumpeterian hypotheses that firms would choose a radical transformation in periods of increasing profits and then switch to a status-quo option when profits fell. However, most students preferred a rational investment option when profits were increasing. The TTP is not contradicted by this result, but by the fact that the significance of the overinvestment answers was ambiguous. Neither could the role play clearly confirm the specific TTP in which the strategy choices in a profit boom are exceptional and also decisive for the strategy choices after an actual profit fall. Furthermore, according to their own assessment, the students were mainly governed by rational concerns in their investment and strategy decisions. The bulk of the students replied that the preference for status quo in a profit recovery reflected that they had become more rational, not that they were governed by the psychological anomalies of the TTP. Most students also reported that they would have transformed the firm already after an expected reduction in

profits and almost all of the remaining students proclaimed that they first reacted to an actual decline to get more information. We have to accept that the role play was unable to verify the TTP idea that the degree of rational behavior in firms depends on current external circumstances. Moreover, in only one of six cases was a consistently rational answer to one question clearly contradicted by an irrational answer to another question.

Our study underpins the view that economics shall not throw the baby out with the bath water by abandoning the assumption of rational behavior. But at the same time the study confirms that "…the deviations of actual behaviour from the normative model are too widespread to be ignored…" (Tversky and Kahneman, 1986, pp. 252). We must also remind the reader that the conducted role play probably had a rational bias.

An obvious objection to our role play is that undergraduate students have neither the ability nor the incentives to enter into the role of managers for an established company. Instead the answers by the students to the questionnaire might have been shaped, notwithstanding the instructions, by their knowledge about macroeconomics and conjectures about the expectations of the experimentalists. On the other hand it is not certain that students would provide a less accurate picture of investments and strategy choices than real firm agents completing a similar questionnaire. Prestigious managers are probably unwilling, even

anonymously, to reveal their true motifs and less able to make a psychological self-diagnosis than students only pretending to be managers. Furthermore the students may experience a role play as more authentic than lab experiments, even if these experiments would involve pecuniary incentives.

The main limitation of our role game is that it cannot reproduce those industry-structural conditions, human capabilities and conventional beliefs among leading groups that constitute the framework for decision-making in the business sector. These structural and institutional factors make it reasonable to expect that firms' reaction to external shocks is industry-, country- and time-specific. Furthermore, the psychological literature does not unanimously support the TTP (Erixon, 2007, pp. 339-342). In fact, a *qualified* TTP refers to psychological mechanisms and industrial characteristics providing room for a *positive* relationship between profits and productivity growth (ibid., pp. 342-344).

Our role play was based on the idea that the reaction by firms to variations in external circumstances in a developed market economy is influenced by some fundamental biological processes and social conventions. We conclude that the completed role play has actually shed light on these basic human instincts and market-conforming conventions and also confirmed, though not unambiguously, the conception of firm strategies and psychologies in the theory of transformation pressure.

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Appendix

A role play – acting as managers for an established (old) company (translation from Swedish)

Starting point:
Assume that you are a manager for a company that had existed for at least 20 years. You shall now make endeavors to imagine how you would have reacted to changes in the rate of return on equity ("profits"). Note that you shall choose the answer alternative that describes how you believe that you would have reacted in a real situation. You shall only choose the alternative which seems to be the best one for you and the company – the most rational – if you are really convinced that you would have chosen that alternative in a real situation. Use your ability to enter into the mind of a manager!

Neither shall you choose the answer alternative that you believe that the experimentalists would have expected. Use your ability to enter into other people's mind but not by the ambition to identify the answers that you think that the experimentalists would want!

Answer the questions in turn. When answering a new question you have no opportunities to correct the answers on earlier questions.

You shall only choose one answer on each question. Please encircle your answer.

The role play is anonymous.

Question 1

Your company has experienced increasing profits during this year and the previous two-three years. (Profits are presented annually.) It is not excluded that other firms, for example your competitors, are also favored by a similar increase in profits. Which decision on investments will you make in this situation and which are your arguments for this decision? The decision is not about the character of the investments. Investments can be made in machinery, buildings, new organizations or in R&D.

The following assumption is made in all questions 1-9:

- The company has the opportunity to borrow cheaply to finance investments, thus the company has no problem of financing the investment.

a) I will increase investments since the profit increase in the firm has a positive effect on my expectations of profits in the future.

b) I will increase investments since the profit increase in my company is a signal that the company will suffer from capacity limitations in the future.

c) I will increase investments fearing that the competitors will react to an actual increase in profits by investments.

d) I will increase investments since investments by other companies will increase the demand for the products/services of my company.

e) I will not necessarily increase investments since my expectations about profits in the future are based on profits over a longer historical period, thus not only on profits this year and the previous years.

f) I will not necessarily increase investments since investments are only determined by expected events in the future, not by profits this year or by earlier profits.

g) I will postpone investments to get a clearer idea of to what extent the profit increase for the company is steady (and not temporary). The postponement makes it possible to make more detailed studies of the historical profit development and/or new observations of the profit development.

Question 2

You shall only answer this question if you have answered a) on question 1.

Try to describe the psychological mechanism explaining that your investment decision was based on the company's profit development during the very last years.

a) Increasing profits for the company this year and the previous years induced me to ignore or give low weight to the earlier profit development. The actual profit development of the company made me ahistorical (myopic).

b) Increasing optimism about the future through the firm's increase in profits made me undiscerning. With other words, the actual profit development of the firm made me intoxicated.

c) Through the high profits I got an exaggerated belief in my and the company's ability to e.g. meet threats in the future. The actual profit development of the firm made me haughty.

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d) Through the high profits I repressed the risks of an investment – I acted self-deceptively.

e) I was carried away by the optimistic atmosphere in an economy characterized by a general increase in profits. My investment propensity expressed a general euphoria in the economy.

Question 3

Assume as above that your firm has experienced an increase in profits this year and the previous two-three years. Which firm strategy would you use in this situation?

a) I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization since it appeared to be profitable – a status-quo strategy without transformation.

b) To meet future threats I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations – a status-quo strategy with transformation.

c) Increasing optimism and longer time perspectives because of the profit boost induced me to make a radical change in product composition, technology or organizations (for example through R&D investments) – a radical transformation.

Question 4

You shall only answer this question if you have answered a) or b) on question 3.

Try to describe your motifs for or the psychological mechanism behind your decision not to transform the company at all or only pursue a status-quo oriented transformation when your company experienced increasing profits during this year and the previous two-three years.

a) The increase in profits made me ignore that the firm must have pursued status-quo oriented transformation or even radical transformation during earlier periods.

b) The higher optimism about the future through the company's increase in profits induced me to make an undiscerning choice of a firm strategy without any transformation at all or a strategy with a status-quo oriented transformation.

c) Through the high profits I got an exaggerated belief in my ability and the company's ability to meet threats in the future which made me believe that there were real arguments for a firm strategy without radical transformation or without any transformation at all in the current situation.

d) Through the high profits I repressed the risks of a status-quo strategy without transformation or of a status-quo strategy with transformation.

e) The increase in profits made me realize that there are unique competencies in the firm explaining that a status-quo strategy (with or without transformation) really is profitable in the future.

Remember:

A status-quo strategy without transformation:
I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:
I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:
I pursue a radical change in product composition, technology or organizations.

Question 5

Which firm strategy would you choose if the increase in profits this year and the previous two-three years was so strong that your company came to experience record-high profits in a historical perspective?

a) I will choose a status-quo strategy without transformation.

b) I will choose a status-quo strategy with transformation.

c) I will pursue a radical transformation.

Remember:

A status-quo strategy without transformation:
I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:
I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:
I pursue a radical change in product composition, technology or organizations.

Question 6

How would you react to new information that your company faced the risk of a substantial decline in profits in the future? Note that the company has experienced three-four years with increasing profits.

a) I will switch from a status-quo strategy without transformation to a status-quo strategy with transformation.

b) I will switch to a radical transformation.

c) I will not change from a status-quo strategy without transformation to a status-quo strategy with transformation or pursue a radical transformation until the company is facing an actual decline in profits.

Remember:

A status-quo strategy without transformation:
I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:
I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:
I pursue a radical change in product composition, technology or organizations.

Question 7

You shall only answer this question if you have answered c) on question 6.

Why will you first change to a status-quo strategy with transformation or pursue a radical transformation when the decline in profits is actual?

a) I postpone a reaction to get a clearer picture of the real character and scope of the profit decline, for example, of to what extent the decline reflected external threats or internal firm conditions.

b) I need an actual decline in profits to abandon my too optimistic view of the firm's prospect and to sober down after the period of increasing profits.

c) I need an actual decline in profits to abandon the false feeling of invulnerability and superiority during the preceding period of increasing profits.

d) I need an actual profit decline to abandon my myopia during the previous period of increasing profits and focus on the profit development during a longer historical period.

e) I need an actual decline in profits to abandon my tendency during the period of increasing profits to repress the risks of a status-quo strategy without transformation or a status-quo strategy with transformation.

f) I have a tendency to overreact to actual reductions in profits (though not necessarily to increasing profits), thus to believe that the actual fall in profits is permanent.

Remember:

A status-quo strategy without transformation:
I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:
I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:
I pursue a radical change in product composition, technology or organizations.

Question 8

Which strategy will you choose if your company experienced an actual decline in profits during a year after three-four years of actual increases in profits?

a) A status-quo strategy without transformation.

b) A status-quo strategy with transformation.

c) A radical transformation

Remember:

A status-quo strategy without transformation:
I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:
I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:
I pursue a radical change in product composition, technology or organizations.

Question 9

You shall only answer this question if you answered b) or c) on question 8.

Did your decision to transform the company depend on the size of the actual decline in profits during the year?

a) Yes – the profit decline must at least be similar to the profit increase in the previous year to persuade me to transform the company.

b) No – even a small decline in profits compared to the profit increase in the previous year would persuade me to transform the company.

Remember:

A status-quo strategy without transformation:
I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:
I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:
I pursue a radical change in product composition, technology or organizations.